The Effect of Aluminum Oxide Sandblasting on Immediate Dentin Sealing

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OBJECTIVES

To evaluate the effect on immediate dentin sealing of different particle sizes of aluminum oxide and different times of exposure to aluminum oxide sandblasting.

METHODS

Thirty healthy molars were subjected to immediate dentin sealing, after exposure of the middle dentin, and divided into three groups (n=10), depending on the diameter of the aluminum oxide particles used for teeth surface treatment (G1:27 µm, G2:50 µm, G3:30 µm (silicatized particles)) after 24hours at 37ºC (Fig. 1,2 and 3). Each of these groups was further divided in two subgroups (n=5) according to the duration of exposure to aluminum oxide sandblasting (T1:4 and T2:10 seconds) (Fig. 4). Three measurements were performed using a digital scanner system (True Definition - 3M ESPE) and the average and maximum values of abrasion were recorded: first reading after cutting the middle dentin; second reading after the application of the adhesive (Immediate Dentin Sealing - IDS); and third reading after the surface treatment (sandblasting with aluminum oxide) according to each group (Fig. 5 and 6). The laboratory protocol is shown in figure 7. Results were obtained by superimposing images, using the Geomagic Control 2014 (USA) computer software (Fig.8). Data were statistically analyzed by using a two-way ANOVA, at a significance level of 5%.

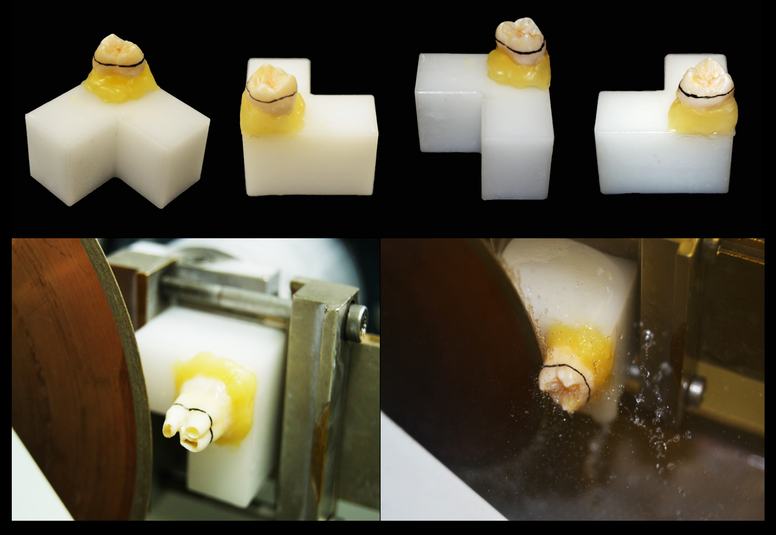


Fig.1 - Fixing the tooth in the acrylic holder; cut of the tooth by the middle dentin and roots

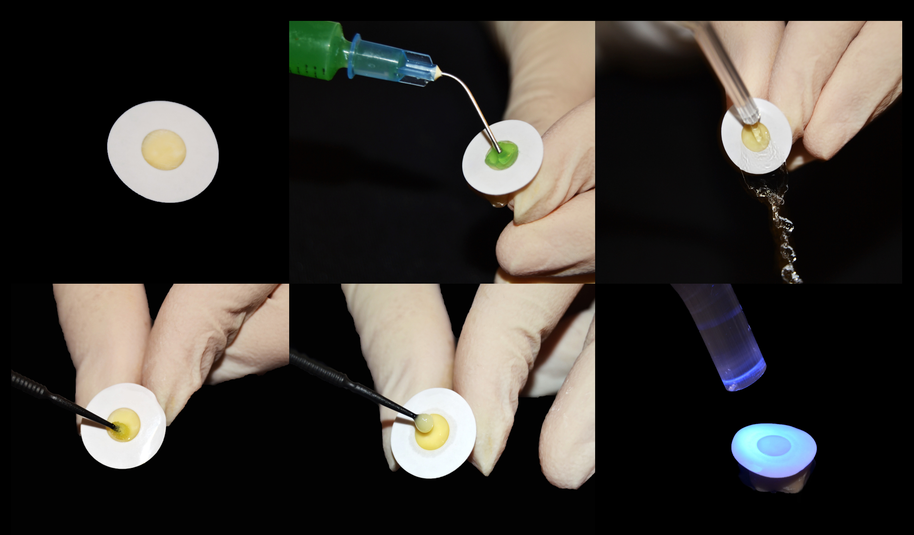
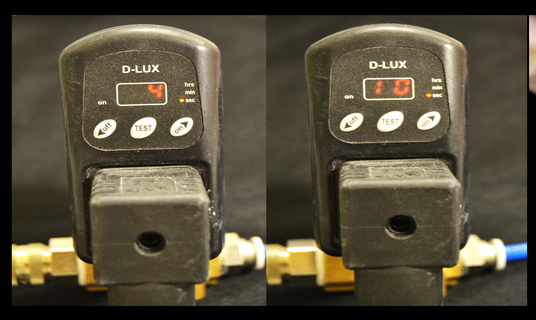


Fig. 2 - Application of IDS technique using the adhesive system Optibond™ FL (Kerr, Orange, USA)

Fig. 3 - Middle dentin exposed; Middle dentin after IDS technique



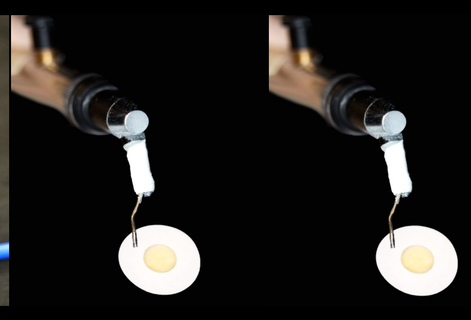


Fig. 4 - Calibration of the exposure time: 4 or 10 seconds, depending on the group; Working distance calibration: 10 mm and blasting with aluminum oxide particles according to the granulometry established for each group

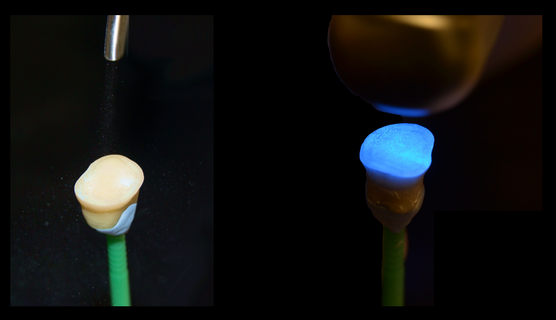


Fig. 5 - 3M™ High-Resolution Scanning Spray application and reading through the optical camera

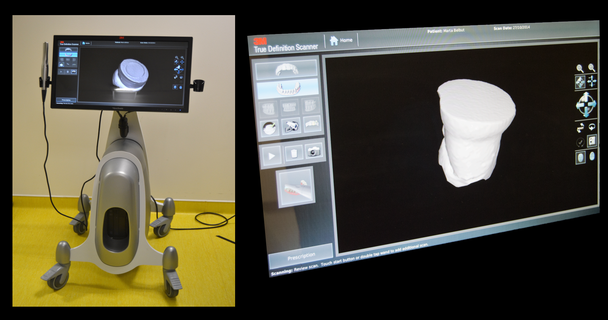


Fig. 6 - True Definition Scanner (3M ESPE); Image of the tooth after blasting resulting from True Definition Scanner (3M ESPE)

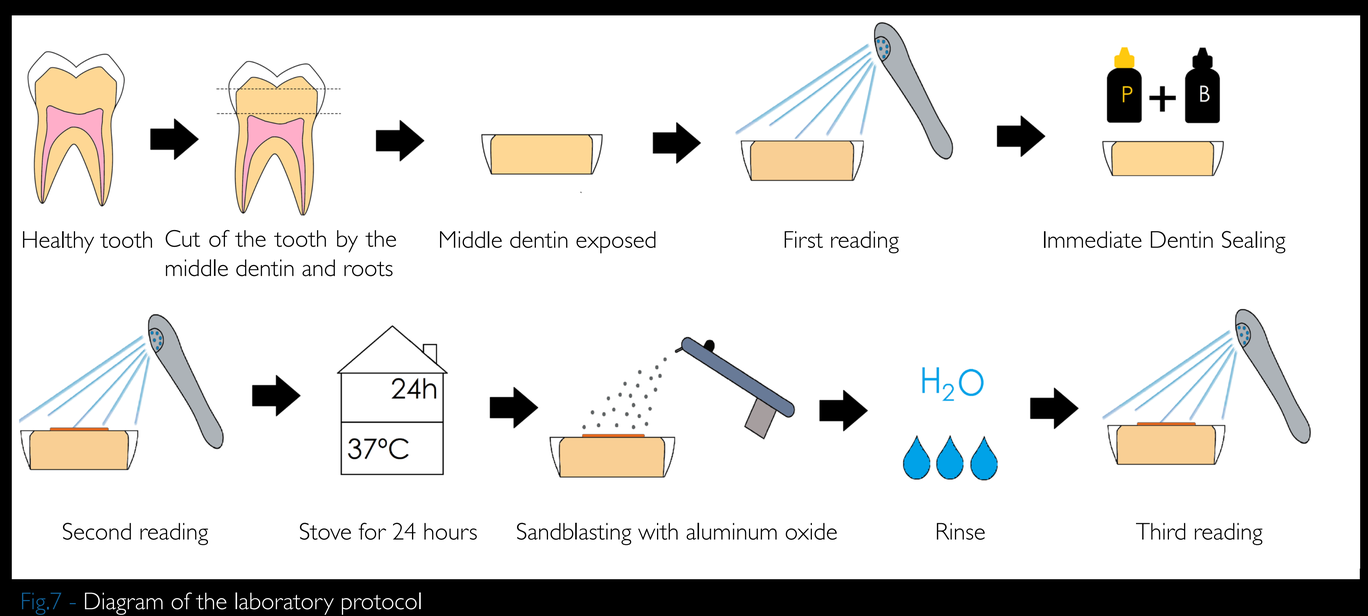


Fig.7 - Diagram of the laboratory protocol

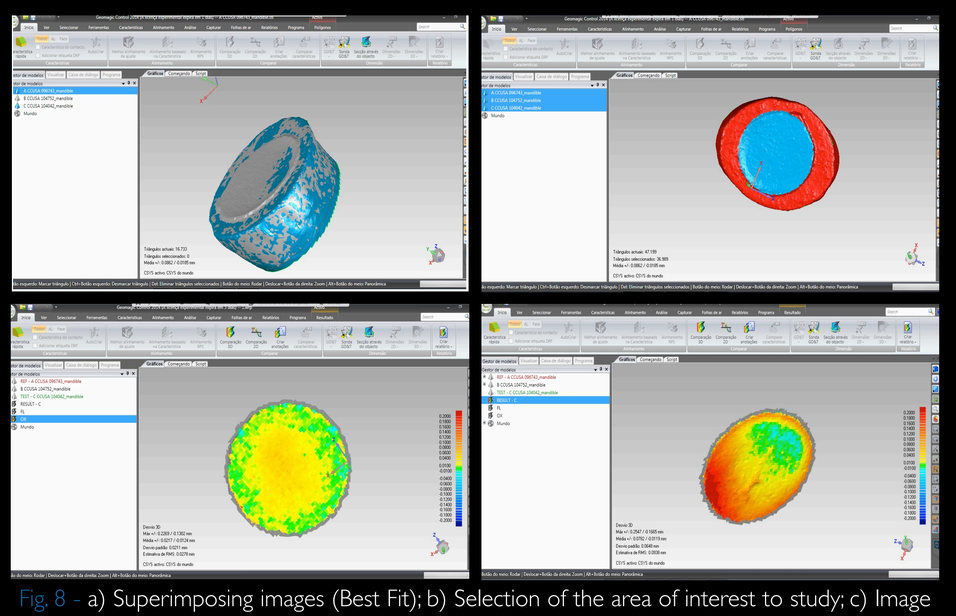


Fig. 8 - a) Superimposing images (Best Fit); b) Selection of the area of interest to study; c) Image obtained from the thickness of the adhesive; d) Image obtained from the abrasion by the aluminum oxide particles in the program Geomagic Control 2014 (EUA)

RESULTS

Concerning the different exposure times, 10 seconds resulted in statistically significant (p=0.009) higher levels of abrasion independently from the size and type of aluminum oxide particles (p=0.671). Additionally, no interaction effect was found (p=0.636).

CONCLUSIONS

The immediate dentin sealing is affected by different exposure times of aluminum oxide sandblasting.

BIBLIOGRAPHY

1. Brigagão, V. C., Barreto, L. F. D., Gonçalves, K. A. S., Amaral, M., Vitti, R. P., Neves, A. C. C., & Silva-Concílio, L. R. (2017). Effect of interim cement application on bond strength between resin cements and dentin: Immediate and delayed dentin sealing. Journal of Prosthetic Dentistry, 117(6), 792–798. http://doi.org/10.1016/j.prosdent.2016.09.015
2. Qanungo, A., Aras, M. A., Chitre, V., Mysore, A., Amin, B., & Daswani, S. R. (2016). Immediate dentin sealing for indirect bonded restorations. Journal of Prosthodontic Research, 60(4), 240–249. http://doi.org/10.1016/j.jpor.2016.04.001
3. Falkensammer, F., Arnetzl, G. V., Wildburger, A., Krall, C., & Freudenthaler, J. (2014). Influence of different conditioning methods on immediate and delayed dentin sealing. The Journal of Prosthetic Dentistry, 112(2), 204–10. doi:10.1016/j.prosdent.2013.10.028
4. Magne, P. (2005). Immediate dentin sealing: a fundamental procedure for indirect bonded restorations. Journal of Esthetic and Restorative Dentistry: Official Publication of the American Academy of Esthetic Dentistry ... [et Al.], 17(3), 144–54; discussion 155. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/15996383
5. Ghiggi, P. C., Steiger, A. K., Marcondes, M. L., Mota, E. G., Burnett, L. H., & Spohr, A. M. (2014). Does immediate dentin sealing influence the polymerization of impression materials? European Journal of Dentistry, 8(3), 366–372. doi:10.4103/1305-7456.137650
6. Chinelatti, M. A., do Amaral, T. H. A., Borsatto, M. C., Palma-Dibb, R. G., & Corona, S. A. M. (2007). Adhesive interfaces of enamel and dentin prepared by air-abrasion at different distances. Applied Surface Science, 253(11), 4866–4871. doi:10.1016/j.apsusc.2006.10.059
7. D'Arcangelo, C., & Vanini, L. (2007). Effect of three surface treatments on the adhesive properties of indirect composite restorations. The Journal of Adhesive Dentistry, 9(3), 319–26. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/17655072